04-02-02

GP2624

Our File: 55254/38

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Ma, et al.

Serial No. : 09/781,529

Filed : February 9, 2001

For : A PRINTING CONTROL INTERFACE SYSTEM AND METHOD WITH HANDWRITING DISCRIMINATION CAPABILITY

"Express Mail" mailing label No. EV 034639044 US
Date of Deposit: April 1, 2002
I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Commissioner for Patents, Washington, D.C. 20231.
Name: John S. Economou
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LETTER TO OFFICIAL DRAFTSPERSON

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Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Applicants hereby submit formal drawings for the above-captioned matter.

No fees are believed to be necessary for the submission of these substitution drawing sheets. However, if fees are due, please debit Deposit Account No. 01-1785. Any refund should be credited to the same account.

Respectfully submitted,

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By:
John S. Economou
Registration No. 38,439

Dated: New York, New York
April 1, 2002

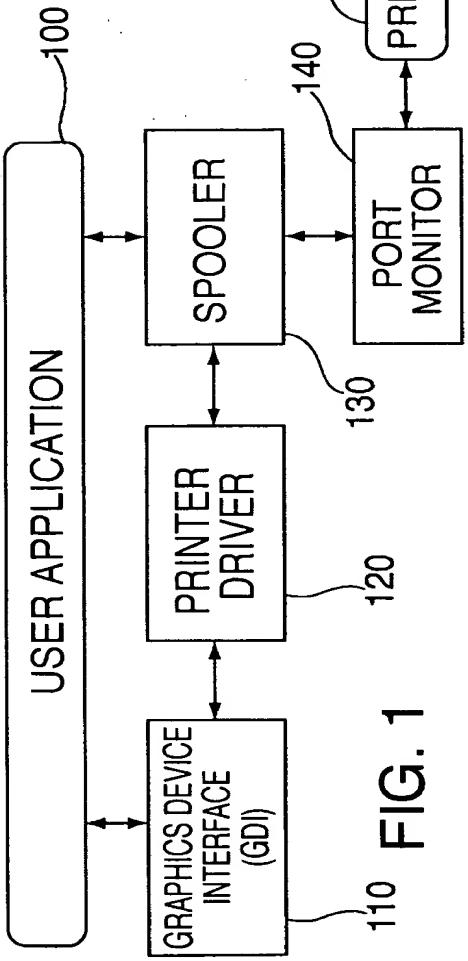
USER APPLICATION
100
SPOOLER
PRINTER DRIVER
GRAPHICS DEVICE INTERFACE (GDI)
110
120
130
140
PORT MONITOR
150
PRINTER

FIG. 1

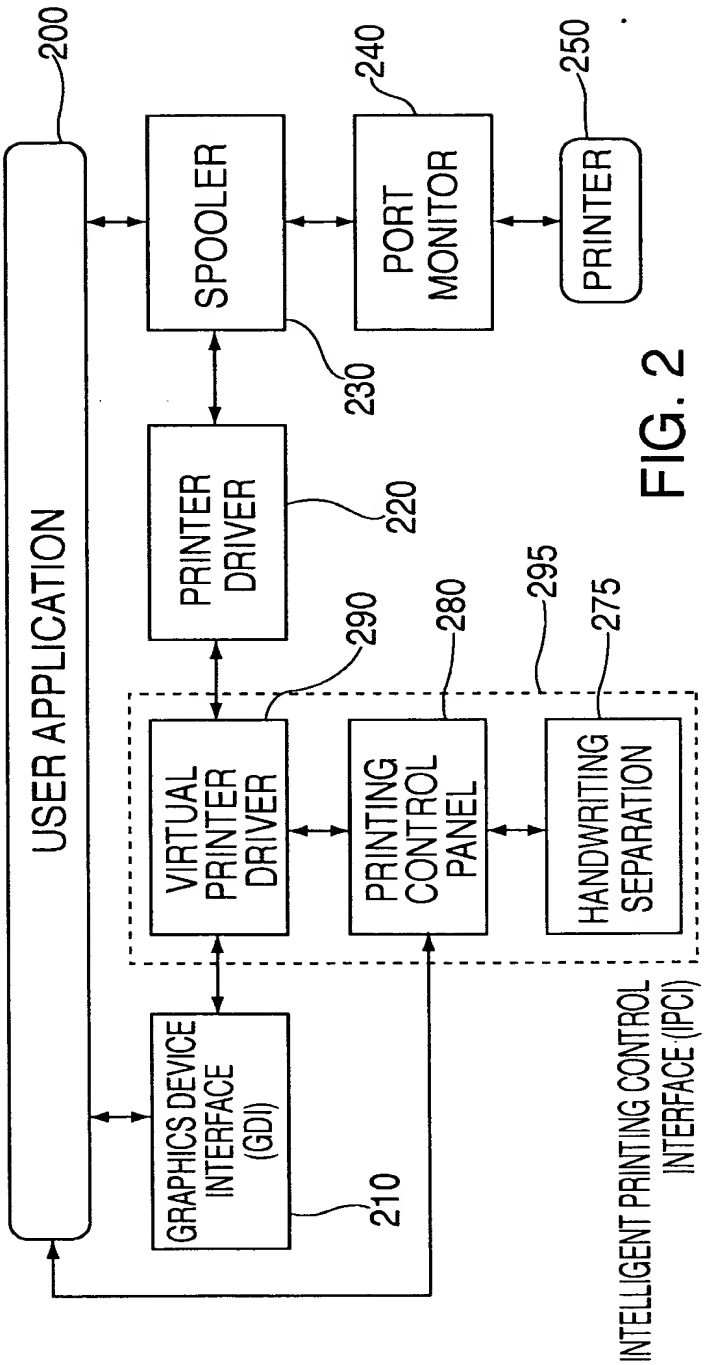
200
USER APPLICATION
SPOOLER
230
PORT MONITOR
240
PRINTER
250
PRINTER DRIVER
220
VIRTUAL PRINTER DRIVER
290
PRINTING CONTROL PANEL
280
HANDWRITING SEPARATION
295
275
GRAPHICS DEVICE INTERFACE (GDI)
210
INTELLIGENT PRINTING CONTROL INTERFACE (IPCI)

FIG. 2

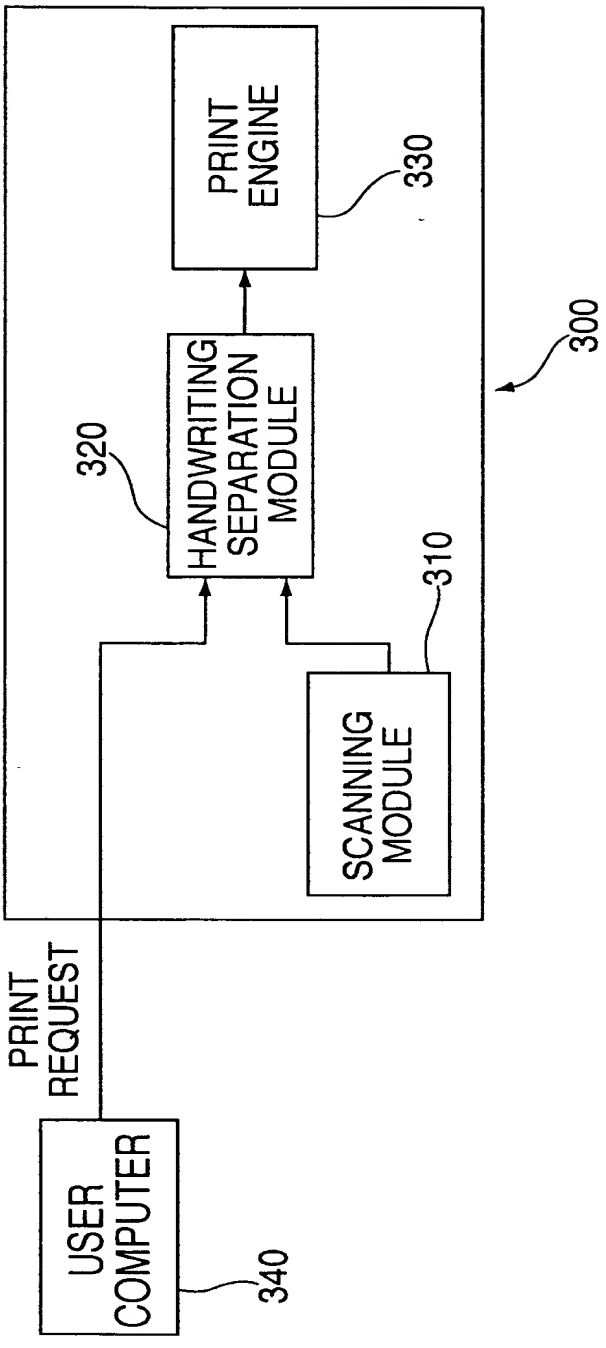
PRINT ENGINE
330
300
320
HANDWRITING SEPARATION MODULE
310
SCANNING MODULE
PRINT REQUEST
USER COMPUTER
340

FIG. 3

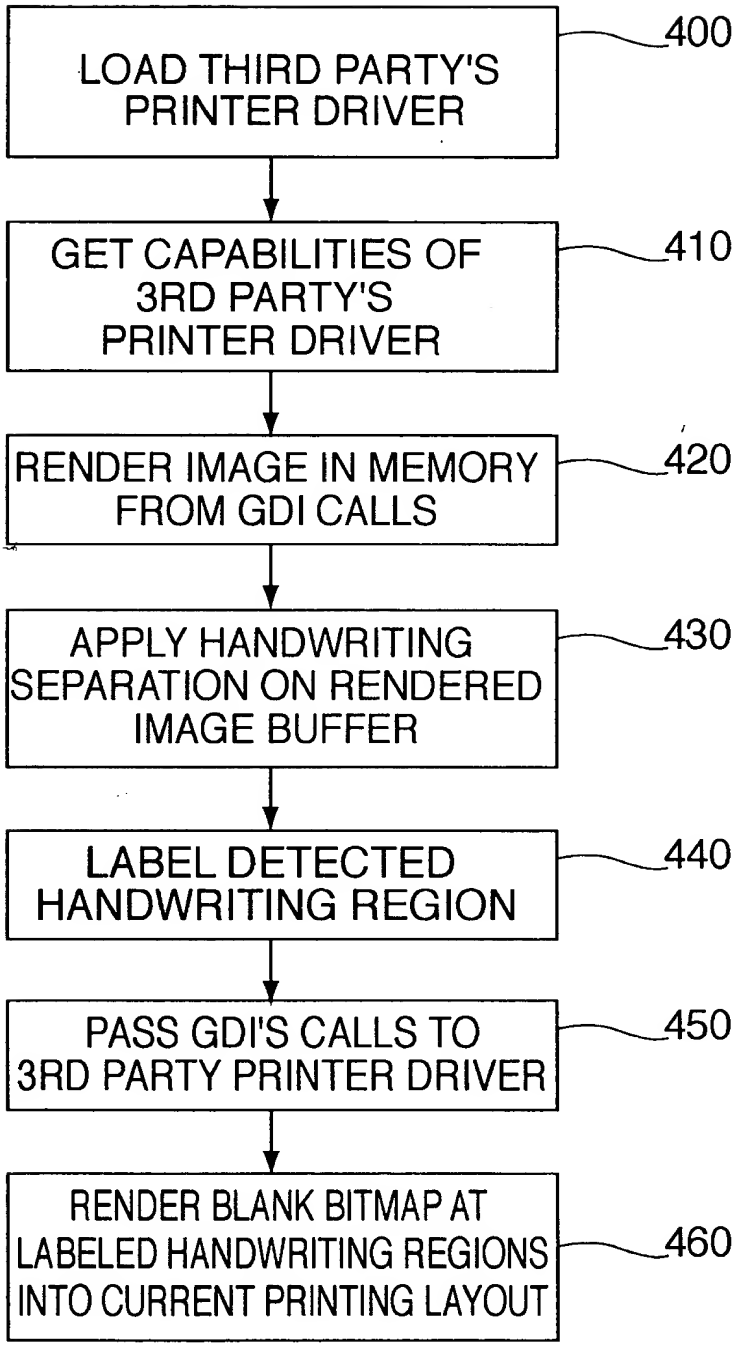
LOAD THIRD PARTY'S PRINTER DRIVER
400
GET CAPABILITIES OF 3RD PARTY'S PRINTER DRIVER
410
RENDER IMAGE IN MEMORY FROM GDI CALLS
420
APPLY HANDWRITING SEPARATION ON RENDERED IMAGE BUFFER
430
LABEL DETECTED HANDWRITING REGION
440
PASS GDI'S CALLS TO 3RD PARTY PRINTER DRIVER
450
RENDER BLANK BITMAP AT LABELED HANDWRITING REGIONS INTO CURRENT PRINTING LAYOUT
460

FIG. 4

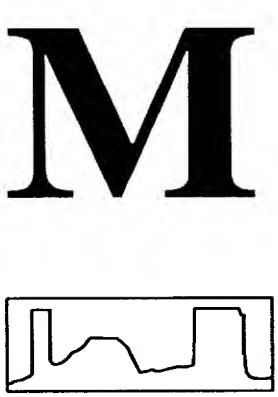

FIG. 5A

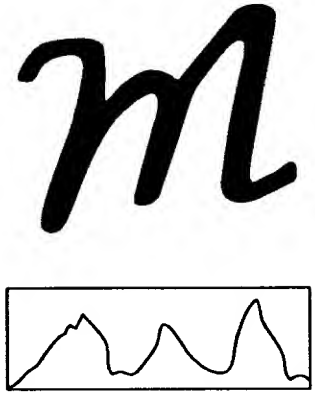

FIG. 5B

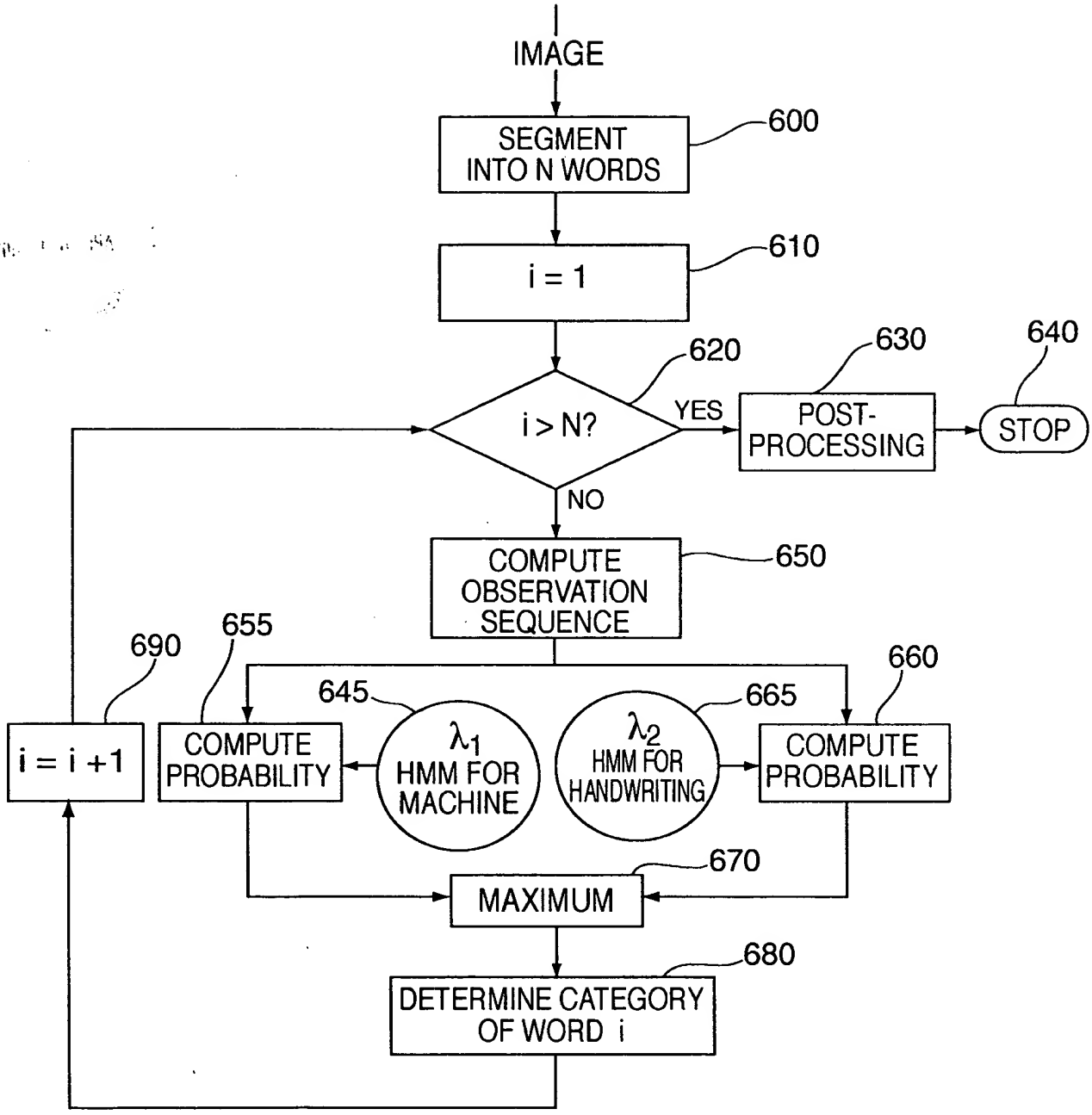
IMAGE
SEGMENT INTO N WORDS
600
i = 1
610
620
630
640
i > N?
YES
POST-PROCESSING
STOP
NO
COMPUTE OBSERVATION SEQUENCE
650
655
690
660
645
665
i = i +1
COMPUTE PROBABILITY
λ1 HMM FOR MACHINE
λ2 HMM FOR HANDWRITING
COMPUTE PROBABILITY
670
MAXIMUM
680
DETERMINE CATEGORY OF WORD i

FIG. 6

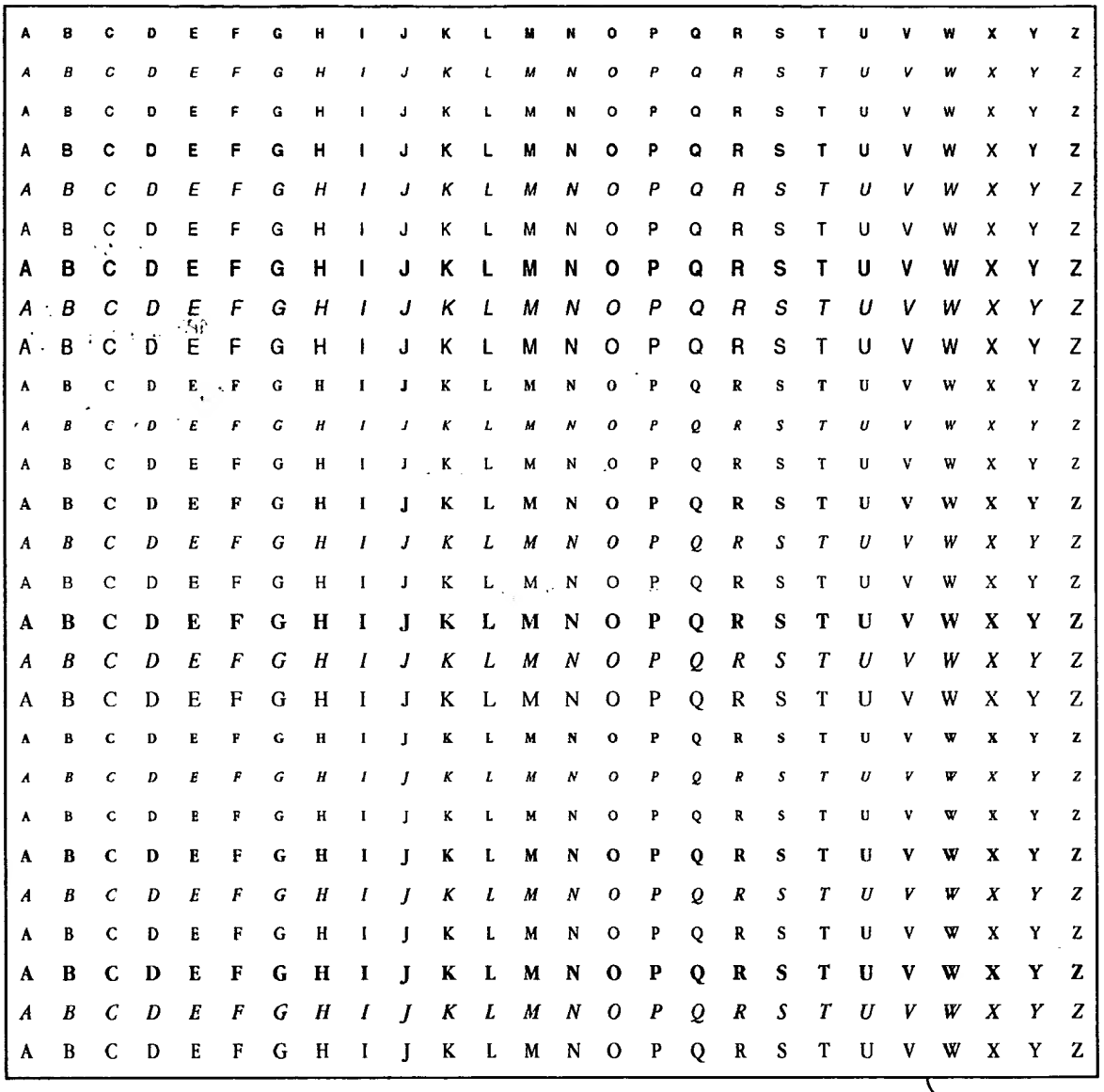

FIG. 7

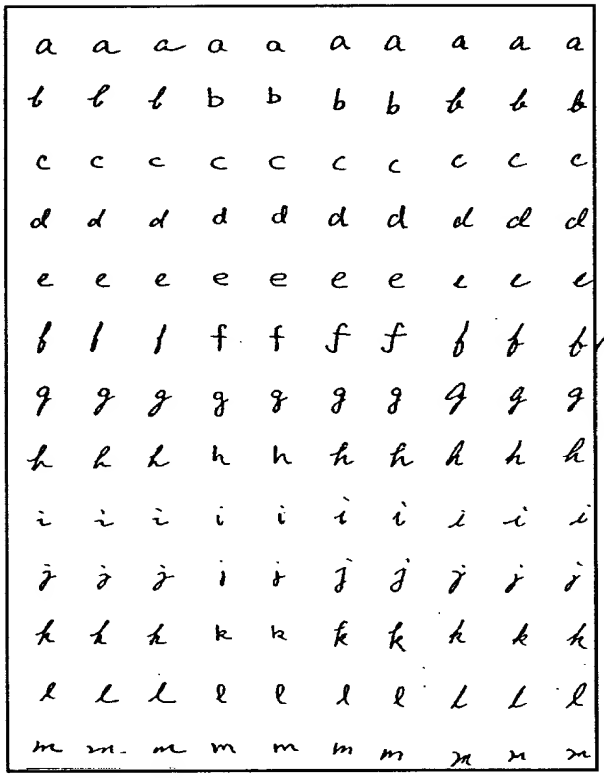

FIG. 8

900

Detecting and Utilizing Add-on Information From a Scanned Document Image

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PINTL-IM-142-099 ← register
March 27, 2000

Abstract

A method for detecting and separating add-on handwritten annotations from a scanned document image is presented. This method combines the projection histogram and line merge techniques in order to discriminate between printed text lines and handwritten annotations. The example shows that it works with simple text documents with handwritten annotations on margin areas or white space within the main text. The algorithm, however, can be extended in order to handle more complex scenarios. Please expand.

Keywords: Handwritten annotation detection, Handwritten annotation separation, Scanned image, Projection histogram, Connected component, Line merge.

FIG. 9

910

Detecting and Utilizing Add-on Information From a Scanned Document Image

915

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PINTL-IM-1142-099 ← register
March 27, 2000

Abstract

A method for detecting and separating add-on handwritten annotations from a scanned document image is presented. This method combines the projection histogram and line merge techniques in order to discriminate between printed text lines and handwritten annotations. The example shows that it works with simple text documents with handwritten annotations on margin areas or white space within the main text. The algorithm, however, can be extended in order to handle more complex scenarios.

Please expand.

Keywords: Handwritten annotation detection, Handwritten annotation separation, Scanned image, Projection histogram, Connected component, Line merge.

FIG. 10

920

Detecting and Utilizing Add-on Information From a Scanned Document Image

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925

PINTL-IM-142-099
March 27, 2000

930

Abstract

A method for detecting and separating add-on handwritten annotations from a scanned document image is presented. This method combines the projection histogram and line merge techniques in order to discriminate between printed text lines and handwritten annotations. The example shows that it works with simple text documents with handwritten annotations on margin areas or white space within the main text. The algorithm, however, can be extended in order to handle more complex scenarios.

Keywords: Handwritten annotation detection, Handwritten annotation separation, Scanned image, Projection histogram, Connected component, Line merge.

FIG. 11